Algebra 2 Midterm Review KEY

(A) Simplifying

1) $4\sqrt{25} \div (9-4) \cdot 2$

$4 \cdot 5 \div 5 \cdot 2$

$20 \div 5 \cdot 2$

$4 \cdot 2$

$\boxed{8}$

2) $10 - \{22 \div [2 + (3 \cdot 3)]\}$

$10 - \{22 \div 11\}$

$10 - 2$

$\boxed{8}$

3) $5x^3 + 2x + 4x^2 - x$

$= \boxed{5x^3 + x + 4x^2}$

4) $(4n^2 - 6n) + 3) - (7n + 3 - 8n^2)$

$= 4n^2 - 6n + 3 - 7n - 3 + 8n^2$

$= \boxed{12n^2 - 13n}$

5) $4(c + 2b) - 3(2c + b)$

$= 4c + 8b - 6c - 3b$

$= \boxed{-2c + 5b}$

6) $(x - 2y) - 4(-x + y) + 2(-4x + 5y)$

$= x - 2y + 4x - 4y - 8x + 10y$

$= \boxed{-3x + 4y}$

(B) Solving Equations

1) $2(x-3)+x=4x+2$

$2x-6+x=4x+2$

$3x-6=4x+2$

$-3x \quad -3x$

$-6=x+2$

$-2 \quad -2$

$-8=x$

2) $5x+6=36$

$-6 \quad -6$

$\frac{5x}{5}=\frac{30}{5}$

$x=6$

3) $6x+2=5x-4$

$-5x \quad -5x$

$x+2=-4$

$-2 \quad -2$

$x=-6$

4) $V \cdot D = M$ (÷ V)

$\frac{V \cdot D}{D} = \frac{M}{D}$

$V = \frac{M}{D}$

5) $2l+2w=P$

$-2l \quad -2l$

$\frac{2w}{2}=\frac{P-2l}{2}$

$w=\frac{P-2l}{2}$

6) $3x^2+7=y$

$-7 \quad -7$

$\frac{3x^2}{3}=\frac{y-7}{3}$

$\sqrt{x^2}=\sqrt{\frac{y-7}{3}}$

$x=\sqrt{\frac{y-7}{3}}$

(C) Radicals

1) $4\sqrt{40}$

$4\sqrt{4}\sqrt{10}$

$= 4 \cdot 2 \cdot \sqrt{10}$

$= \boxed{8\sqrt{10}}$

2) $\sqrt{68}$

$= \sqrt{4}\sqrt{17}$

$= \boxed{2\sqrt{17}}$

3) $\frac{10}{7\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{10\sqrt{3}}{7 \cdot 3} = \boxed{\frac{10\sqrt{3}}{21}}$

4) $\sqrt{112a^3b^2}$

$= \sqrt{16}\sqrt{7}\sqrt{a^2}\sqrt{a}\sqrt{b^2}$

$= \boxed{4ab\sqrt{7a}}$

5) $\sqrt[4]{8a^3b} = (8a^3b)^{\frac{1}{4}}$

(D) Translating

1) $n^3 - 10$ 2) $6(x+2)$ 3) $w = 5l - 3$ 4) $(x-y)^3 = 8$

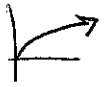
(E) Function Families

1) $f(x) = x$ 

2) $f(x) = |x|$ 

3) $f(x) = x^2$ 

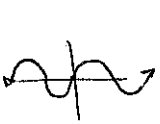
4) $f(x) = x^3$ 

5) $f(x) = \sqrt{x}$ 

6) $f(x) = \frac{1}{x}$ 

7) $f(x) = e^x$ 

8) $f(x) = \ln x$ 

9) $f(x) = \sin x$ 

(F) Testing Functions

1) No 2) yes 3) yes 4) no

(G) Domain + Range

1) D: $\mathbb{R}$
R: $[-3, \infty)$

2) D: $\{-4, 1, 2, 6\}$
R: $\{-1, 4, 8, 9\}$

3) D: $[-2, \infty)$
R: $\mathbb{R}$

(H) Evaluating + Combining

1) $(f+g)(x) = 6x - 3 + 2x^2 - 5x + 9$
$= \boxed{2x^2 + x + 6}$

2) $(f-g)(x) = 6x - 3 - (2x^2 - 5x + 9)$
$= 6x - 3 - 2x^2 + 5x - 9$
$= \boxed{-2x^2 + 11x - 12}$

3) $(h \cdot g)(x) = 5x(2x^2 - 5x + 9)$
$= \boxed{10x^3 - 25x^2 + 45x}$

4) $\left(\frac{g}{f}\right)(x) = \frac{2x^2 - 5x + 9}{6x - 3}$

5) $g(-3) = 2(-3)^2 - 5(-3) + 9$
$= 2 \cdot 9 + 15 + 9$
$= 18 + 15 + 9 = \boxed{42}$

(I) Composition

1) $h \circ f = h[f(x)] = h(9x-4)$

$= 3(9x-4)$

$= \boxed{27x-12}$

2) $f \circ h = f[h(x)] = f(3x)$

$= 9(3x) - 4$

$= \boxed{27x-4}$

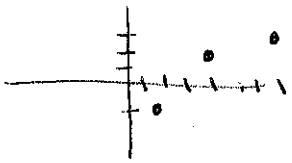
3) $f[h(-4)]$

$h(-4) = 3(-4) = -12$

$f(-12) = 9(-12) - 4 = -108 - 4 = \boxed{-112}$

(J) Inverse Functions

1) $f^{-1} = \{(4,2), (2,-1), (7,3)\}$



2) $f(x) = 3x + 6$

$y = 3x + 6$

$-6 \quad -6$

$\frac{y-6}{3} = \frac{3x}{3}$

$\frac{y-6}{3} = x$

$\frac{1}{3}y - 2 = x$

$\frac{1}{3}x - 2 = y$

$\boxed{f^{-1} = \frac{1}{3}x - 2}$

3) $\frac{y+6}{5} = \frac{5x}{5}$

$\frac{1}{5}y + \frac{6}{5} = x$

$\frac{1}{5}x + \frac{6}{5} = y$

$\boxed{f^{-1} = \frac{1}{5}x + \frac{6}{5}}$

(K) Writing Eq. of Line

1) $y = 5x + 7$

2) $M = 3$ $(0, -\frac{1}{2})$ → means $b = -\frac{1}{2}$

$y = 3x - \frac{1}{2}$

3) $M = -2$ $(-4, 6)$ (x, y)

$y = -2x + b$

$6 = -2(-4) + b$

$6 = 8 + b$

$-8 \quad -8$

$-2 = b$

or

x	y	
-4	6	> -2
-3	4	> -2
-2	2	> -2
-1	0	
0	-2	

$y = -2x - 2$

4) $M = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{13-7}{6-4} = \frac{6}{2} = 3$

$y = 3x - 5$

$y = 3x + b$

$7 = 3(4) + b$

$7 = 12 + b$

$-12 \quad -12$

$-5 = b$

Now plug in either point

Ex: (4, 7)

x, y

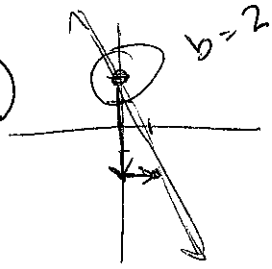
5)

x	y	
-1	4	
0	6	+2 → b = 6
1	8	+2

(+1 between each)

$M = \frac{2}{1} = 2$

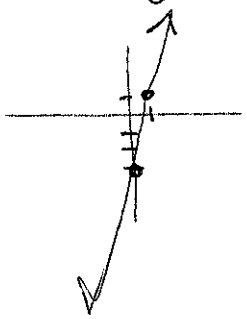
$y = 2x + 6$

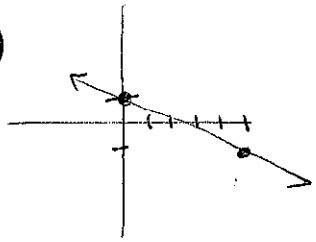
6) 

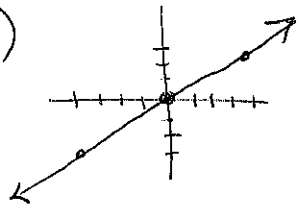
$M = \frac{\Delta y}{\Delta x} = \frac{-4}{1} = -4$

$y = -4x + 2$

(L) Graphing

1) 

2) 

3) 

(M) Transformations

1) $y = -4x + 2$
   - reflected
   - steeper
   - shift up 2

2) $y = \frac{1}{3}x - 4$
   - flatter
   - shift down 4

(N) Linear Applications

1) cost for each = 3.50 + 0.75 = \$4.25 per banner

profit = in − out
= 11 − 4.25 = \$6.75 per banner

$\frac{500}{6.75} = 74.07 \Rightarrow$ need to sell (75 banners)

2) a. $M = 12$ - cost per box b. $b = 100$ - flat rate

c. independent = # boxes
dependent = cost

d. $y = 12x + 100$

e. $f(15) = 12(15) + 100$
$= \$280$

f.

D: # boxes	R: \$
1	112
2	124
3	136
4	148
⋮	⋮
15	280

D: $\{1, 2, 3, 4, \ldots, 15\}$

R: $\{112, 124, 136, 148, \ldots 280\}$

(0) Systems & Equations

1) C = chickens P = pigs

animals : $C + P = 13$

legs : $2C + 4P = 40$

$\rightarrow \left[\begin{array}{cc|c} 1 & 1 & 13 \\ 2 & 4 & 40 \end{array}\right] \overset{\text{rref}}{\sim} \left[\begin{array}{cc|c} 1 & 0 & 6 \\ 0 & 1 & 7 \end{array}\right] \begin{array}{l} \rightarrow C = 6 \\ \rightarrow P = 7 \end{array}$

C P

6 chicken + 7 pigs

2) f = fancy
P = plain

$f + P = 7$

$28f + 15P = 131$

$\rightarrow \left[\begin{array}{cc|c} 1 & 1 & 7 \\ 28 & 15 & 131 \end{array}\right] \overset{\text{rref}}{\sim} \left[\begin{array}{cc|c} 1 & 0 & 2 \\ 0 & 1 & 5 \end{array}\right] \begin{array}{l} \rightarrow f = 2 \\ \rightarrow P = 5 \end{array}$

f P

2 fancy & 5 plain

3) d = hot dogs
h = hamburgers
s = soft drinks = ?

$d = 2h \qquad s = 3h \qquad 1d + 1h + 1S = 720$

Method 1: $d + h + s = 720$

$2h + h + 3h = 720$

$6h = 720$

$h = 120$

$s = 3h$
$= 3(120)$
$= \boxed{360 \text{ soft drinks}}$

Method 2: $d = 2h$
$-2h \quad -2h$
$d - 2h = 0$

$s = 3h$
$-3h \quad -3h$
$s - 3h = 0$

$d + h + s = 720$
$d - 2h = 0$
$-3h + s = 0$

$\rightarrow \left[\begin{array}{ccc|c} 1 & 1 & 1 & 720 \\ 1 & -2 & 0 & 0 \\ 0 & -3 & 1 & 0 \end{array}\right]$

$\overset{\text{rref}}{\sim} \left[\begin{array}{ccc|c} 1 & 0 & 0 & 240 \\ 0 & 1 & 0 & 120 \\ 0 & 0 & 1 & 360 \end{array}\right]$

d h s

360 soft drinks